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# EFFECT OF GROWTH REGULATORS ON PLANT HEIGHT OF FOLIAGE PLANTS

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***ABSTRACT***

***The study on "Effect of Growth Regulators on Plant Height of Foliage Plants" was conducted during 2013-2014 in the Department of Pomology and Floriculture, College of Horticulture, Vellanikkara. The main objective of the study is to determine the effect of application of growth retardants on plant canopy and subsequent interior performance of selected foliage plants. Six species of foliage plants viz., Dieffenbachia amoena and Dracaena sanderiana (Upright type), Syngonium podophyllum and Scindapsus aureus (Climbing type), Ficus benjamina and Schefflera arboricola (Tree like) were selected for the study. The selected foliage plants were kept under greenhouse with 50% shade. Growth retarding chemicals viz., ancymidol, paclobutrazol, B-nine and cycocel with two concentrations each, were applied at three months and six months after planting. Observations on quantitative and qualitative characters were recorded. Among the quantitative characters, the plant height was lowest in T4 (cycocel 1000 ppm) in upright plants and T2 (ancymidol 1000 ppm) in Scindapsus aureus with the highest in control. The lowest plant spread was due to T7 (cycocel 1000 ppm) in Dracaena sanderiana and T8 (cycocel 2000 ppm) in Dieffenbachia amoena with the highest in control..***

***KEYWORDS: Plant Height, Dieffenbachia, Dracaena, Syngonium & Growth Regulators***

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## INTRODUCTION

During the past few years, we have witnessed a significant change in our urban housing system. Interior plants are an ideal way to create attractive and restful settings while enhancing our sense of well-being). Foliage plants form an interesting group of ornamentals, generally grown for their attractive foliage and can be retained for their beauty for longer periods in an interior environment. When plants are placed in the home or office, their continued growth may cause them to appear unsightly. Often, this growth will appear unattractive because of long thin vines and/or chlorotic leaves, possibly caused by improper levels of fertilization, water and light. A method of reducing growth at a specific time without causing discoloration or disfiguration of the plant would be beneficial for the foliage grower as well as the home owner or indoor landscape supervisor (Poole, 1970). Plant growth retardants are applied to horticultural crops to reduce unwanted longitudinal shoot growth without lowering plant productivity. Plant growth retardants (PGRs) are chemicals that are designed to affect plant growth and/or development. They are also useful in controlling growth, manipulating shape and size making them more compact by reducing petiole length for use as attractive indoor plants (Anderson and Andersen, 2000). The foliage and interiorscape plant industries would benefit from plant growth regulators programme that would reduce or eliminate the need to replace or prune plants (Pennisi, 2006).

## MATERIALS AND METHODS

The investigation entitled "Effect of Growth Regulators on Plant Height of Foliage Plants" was conducted at the Department of Pomology and Floriculture, College of Horticulture, Vellanikkara, Thrissur during 2013-14. Six species of foliage plants, representing a wide spectrum of morphological variability were selected for the study viz., *Dieffenbachia amoena, Dracaena sanderiana, Syngonium podophyllum, Scindapsus aureus Ficus benjamina Schefflera arboricola.* Two species were selected from each of the groups *viz.,* upright type, climbing type and tree like type. The selected foliage plant species were evaluated after application of growth retardants in a shade house with 50% shade and later placed in the interior under medium light intensity (800-2000 Lux). Growth retarding chemicals viz., ancymidol (A-rest), paclobutrazol (Bonzi), B-nine (Alar) and cycocel (CCC) with two concentrations each, were used in the experiment. There were totally nine treatments and the plants were sprayed *viz.,* T1 – Ancimidol @ 500ppm, T2– Ancimidol @ 1000ppm, T3 - Paclobutrazol @ 50ppm, T 4 - Paclobutrazol @ 100ppm, T5 – B-nine @ 1000ppm, T6 - B-nine @ 2000ppm, T7 - Cycocel @ 1000ppm, T8 –Cycocel @ 2000ppm, T9-Control, with growth retardants in two schedules of application at 3 months and 6 months, and the treatment without application of growth retardant was taken as control. The details of the experiment and observations were recorded on morphological traits and other characters for 3 months after applications. For experiment conducted in shade house structure, a completely randomized block design with three replications and each with five plants was laid out.

## RESULTS AND DISCUSSIONS

Results obtained from the experiment '"Effect of Growth Regulators on Plant Height of Foliage Plants" using six different species *viz., Dieffenbachia amoena, Dracaena sanderiana, Syngonium podophyllum, Scindapsus aureus, Ficus benjamina and Schefflera arboricola* are presented in table 1 a, 1 b, 1 c 1 d, 1 e. Uniform three month old plants were selected, kept under greenhouse and the growth regulators viz., ancymidol, paclobutrazol, B-Nine and cycocel each at two concentrations were applied at two intervals, three months and six months after planting. The effect of growth retardants on different characters of plant species were evaluated and compared with control.

Among the qualitative characters, the plant height was effectively reduced by (CCC 1000 ppm) in *Dieffenbachia amoena* (42.59 cm) and in *Dracaena sanderiana* (32.64 cm) compared to the control (69.46 cm and 61.22 cm). Cycocel reduces elongation by interfering with the biosynthetic steps directly before ent – kaurene, a precursor in gibberrilin biosynthesis pathway (Rademacher, 1991). The results are in confirmation with the findings of Henny *et al.,* (1994) in *Barleria cristata* (Phillipine white), where the application of CCC 1000 ppm had resulted in shorter plants compared to untreated plants (T 7). The treatment T4 (paclobutrazol 100 ppm) effectively reduced plant height in *Syngonium podophyllum*(225.50 cm), in *Ficus benjamina* (41.79 cm), in *Schefflera arboricola* (34.10 cm) compared to control (260.29 cm, 91.90 cm and 47.80 cm). Bonzi™ (paclobutrazol), of the triazole group, is a more recent height retardant. Compared to other PGRs, triazoles are effective at relatively low doses and are non- phytotoxic (Basra, 2000). Paclobutrazol retard plant height by inhibiting gibberellic acid biosynthesis (Rademacher, 1991) which is responsible for stem growth and shoot elongation. Barrett and Nell (1983) reported that elongation of *Ficus benjamina* L. treated with paclobutrazol sprays at 500 and 2000 ppm concentrations were 12 cm and 7 cm, respectively, compared to untreated plants (27 cm). In *Scindapsus aureus,* the plant height was effectively reduced by T2 (ancymidol 1000 ppm) (206.02 cm) compared to the control (261.65cm). A- Rest™ (ancymidol), a pyrimidine analog, is used primarily to retard stem elongation of annuals and perennials grown in containers (Basra, 2000). Ancimidol retards plant height by inhibiting gibberellic acid biosynthesis

(Rademacher, 1991), which is responsible for stem growth and shoot elongation. The results are in confirmation with the findings of Henley and Poole (1974) ,who stated that ancymidol was most effective in reducing elongation of *Brassaia actinophylla, Gynura sarmentosa, Syngonium podophyllum* and *Pilea sps* by 1.08 cm, 3.88 cm, 1.76 cm and 2.24 cm 143 compared to the similar plant species kept untreated (4.24 cm, 10.52 cm, 2.24 cm and 2.68 cm). (CCC 2000 ppm) in *Dieffenbachia amoena* (48.54 cm) compared to control (62.51 cm).

**Table 1a: Effect of Application of Growth Retardants on Plant Height in *Dieffenbachia Amoena***

| Treatments | 3rd Month | 4th Month | 5thMonth | 6thMonth | 7th Month | 8th Month | 9th Month |
|---|---|---|---|---|---|---|---|
| $T_1$ | $44.10^{b}$ | $46.27^{bc}$ | $48.32^{bcd}$ | $50.25^{bc}$ | $52.12^{bc}$ | $53.85^{c}$ | $55.49^{c}$ |
| $T_2$ | $41.60^{b}$ | $43.75^{bc}$ | $45.78^{bc}$ | $47.69^{bc}$ | $49.54^{bc}$ | $51.25^{bc}$ | $52.87^{bc}$ |
| $T_3$ | $45.49^{b}$ | $48.20^{bc}$ | $50.79^{cd}$ | $53.26^{cd}$ | $55.67^{cd}$ | $57.94^{c}$ | $60.12^{c}$ |
| $T_4$ | $44.66^{b}$ | $47.17^{bc}$ | $49.56^{bcd}$ | $51.83^{cd}$ | $54.04^{c}$ | $56.11^{c}$ | $58.09^{c}$ |
| $T_5$ | $45.82^{b}$ | $49.80^{c}$ | $53.80^{d}$ | $57.60^{d}$ | $61.30^{d}$ | $64.90^{d}$ | $68.40^{d}$ |
| $T_6$ | $44.80^{b}$ | $48.83^{c}$ | $52.83^{d}$ | $56.63^{d}$ | $60.32^{d}$ | $63.92^{d}$ | $67.43^{d}$ |
| $T_7$ | $34.38^{a}$ | $36.02^{a}$ | $37.54^{a}$ | $38.94^{a}$ | $40.28^{a}$ | $41.48^{a}$ | $42.59^{a}$ |
| $T_8$ | $39.54^{ab}$ | $41.11^{ab}$ | $42.56^{ab}$ | $43.89^{ab}$ | $45.16^{ab}$ | $46.29^{ab}$ | $47.30^{ab}$ |
| $T_9$ | $46.85^{b}$ | $50.89^{c}$ | $54.81^{d}$ | $58.61^{d}$ | $62.35^{d}$ | $65.95^{d}$ | $69.46^{d}$ |

**Table 1b: Effect of Application of Growth Retardants on Plant Height in *Dracena Sanderiana***

| Treatments | 3rd Month | 4th Month | 5thMonth | 6thMonth | 7th Month | 8th Month | 9th Month |
|---|---|---|---|---|---|---|---|
| $T_1$ | $34.05^{ab}$ | $36.23^{ab}$ | $38.30^{ab}$ | $40.25^{ab}$ | $42.11^{ab}$ | $43.93^{b}$ | $45.71^{bc}$ |
| $T_2$ | $41.66^{b}$ | $43.15^{bc}$ | $44.57^{b}$ | $45.85^{b}$ | $47.04^{b}$ | $48.19^{bc}$ | $49.26^{bcd}$ |
| $T_3$ | $38.77^{ab}$ | $42.41^{b}$ | $45.94^{b}$ | $49.35^{b}$ | $52.67^{b}$ | $55.95^{c}$ | 59.15d$^{c}$ |
| $T_4$ | $38.61^{ab}$ | $41.78^{ab}$ | $44.84^{b}$ | $47.78^{b}$ | $50.63^{b}$ | $53.44^{bc}$ | $56.17^{cde}$ |
| $T_5$ | $32.94^{ab}$ | $37.73^{ab}$ | $42.41^{b}$ | $46.97^{b}$ | $51.44^{b}$ | $55.87^{c}$ | $6022^{c}$ |
| $T_6$ | $31.94^{ab}$ | $36.73^{ab}$ | $41.41^{b}$ | $45.97^{b}$ | $50.44^{b}$ | $54.87^{c}$ | $59.22^{c}$ |
| $T_7$ | $28.88^{a}$ | $29.75^{a}$ | $30.51^{a}$ | $31.15^{a}$ | $31.70^{a}$ | $32.21^{a}$ | $32.64^{a}$ |
| $T_8$ | $43.60^{b}$ | $44.01^{b}$ | $44.31^{b}$ | $44.49^{b}$ | $44.58^{b}$ | $44.63^{b}$ | $44.64^{b}$ |
| $T_9$ | $33.94^{ab}$ | $38.73^{ab}$ | $43.41^{b}$ | $47.97^{b}$ | $52.44^{b}$ | $56.87^{c}$ | $61.22^{c}$ |

**Table 1c: Effect of Application of Growth Retardants on Plant Height in *Syngonium Podophyllum***

| Treatments | 3rd Month | 4th Month | 5thMonth | 6thMonth | 7th Month | 8th Month | 9th Month |
|---|---|---|---|---|---|---|---|
| $T_1$ | $31.35^{a}$ | $67.68^{ab}$ | $103.77^{a}$ | $139.76^{c}$ | $174.97^{b}$ | $210.12^{b}$ | $245.02^{c}$ |
| $T_2$ | $31.40^{a}$ | $66.73^{a}$ | $101.82^{a}$ | $136.61^{abc}$ | $171.02^{b}$ | $205.17^{b}$ | $239.07^{b}$ |
| $T_3$ | $31.94^{a}$ | $65.27^{a}$ | $98.36^{a}$ | $131.15^{a}$ | $163.56^{a}$ | $195.71^{a}$ | $227.61^{a}$ |
| $T_4$ | $35.83^{a}$ | $68.16^{ab}$ | $100.25^{a}$ | $132.04^{ab}$ | $163.45^{a}$ | $194.60^{a}$ | $225.50^{a}$ |
| $T_5$ | $33.62^{a}$ | $71.95^{b}$ | $110.04^{a}$ | $147.83^{d}$ | $185.24^{c}$ | $222.39^{c}$ | $259.29^{d}$ |
| $T_6$ | $33.62^{a}$ | $70.95^{b}$ | $109.04^{a}$ | $146.83^{d}$ | $184.24^{c}$ | $221.39^{c}$ | $258.29^{d}$ |
| $T_7$ | $32.38^{a}$ | $67.71^{ab}$ | $102.80^{a}$ | $137.59^{bc}$ | $172.00^{b}$ | $206.15^{b}$ | $240.05^{bc}$ |
| $T_8$ | $31.30^{a}$ | $64.93^{a}$ | $98.32^{a}$ | $131.41^{a}$ | $164.12^{a}$ | $196.57^{a}$ | $228.77^{a}$ |
| $T_9$ | $34.62^{a}$ | $72.95^{b}$ | $111.04^{a}$ | $148.83^{d}$ | $186.24^{c}$ | $223.39^{c}$ | $269.29^{d}$ |

**Table 1d: Effect of Application of Growth Retardants on Plant Height in *Dieffenbachia Amoena***

| Treatments | 3rd Month | 4th Month | 5thMonth | 6thMonth | 7th Month | 8th Month | 9th Month |
|---|---|---|---|---|---|---|---|
| $T_1$ | $44.13^{b}$ | $73.23^{bc}$ | $101.93^{abc}$ | $130.44^{ab}$ | $158.64^{a}$ | $186.44^{a}$ | $213.95^{a}$ |
| $T_2$ | $40.40^{ab}$ | $68.80^{abc}$ | $96.80^{abc}$ | $124.61^{a}$ | $152.11^{a}$ | $179.21^{a}$ | $206.02^{a}$ |
| $T_3$ | $45.30^{b}$ | $78.07^{c}$ | $110.44^{c}$ | $142.62^{bc}$ | $174.79^{b}$ | $205.96^{b}$ | $237.14^{b}$ |
| $T_4$ | $32.31^{ab}$ | $63.08^{ab}$ | $93.45^{ab}$ | $123.63^{a}$ | $153.50^{a}$ | $182.97^{a}$ | $212.15^{a}$ |
| $T_5$ | $25.43^{a}$ | $65.43^{abc}$ | $105.03^{bc}$ | $144.44^{c}$ | $183.54^{b}$ | $222.24^{c}$ | $260.65^{c}$ |
| $T_6$ | $24.43^{a}$ | $64.43^{abc}$ | $104.03^{bc}$ | $143.44^{c}$ | $182.54^{b}$ | $221.24^{c}$ | $259.65^{c}$ |
| $T_7$ | $34.03^{ab}$ | $69.03^{abc}$ | $103.63^{bc}$ | $138.04^{bc}$ | $172.14^{b}$ | $205.84^{b}$ | $239.25^{b}$ |
| $T_8$ | $27.76^{a}$ | $58.78^{a}$ | $89.40^{a}$ | $119.83^{a}$ | $149.95^{a}$ | $179.67^{a}$ | $209.10^{a}$ |
| $T_9$ | $26.43^{a}$ | $66.43^{abc}$ | $106.03^{bc}$ | $145.44^{c}$ | $184.54^{b}$ | $223.24^{c}$ | $261.65^{c}$ |

**Table 1e: Effect of Application of Growth Retardants on Plant Height in *Ficus Benjamina***

| Treatments | 3rd Month | 4th Month | 5thMonth | 6thMonth | 7th Month | 8th Month | 9th Month |
|---|---|---|---|---|---|---|---|
| $T_1$ | $24.52^{abc}$ | $31.02^{c}$ | $37.39^{c}$ | $44.65^{d}$ | $51.81^{d}$ | $58.90^{d}$ | $67.7^{d}$ |
| $T_2$ | $24.83^{bc}$ | $29.93^{bc}$ | $34.90^{bc}$ | $40.76^{cd}$ | $46.52^{c}$ | $52.21^{c}$ | $57.78^{c}$ |
| $T_3$ | $20.95^{ab}$ | $25.45^{ab}$ | $29.82^{ab}$ | $35.08^{ab}$ | $40.24^{b}$ | $45.30^{b}$ | $50.30^{b}$ |
| $T_4$ | $19.64^{ab}$ | $22.94^{ab}$ | $26.11^{a}$ | $30.17^{a}$ | $34.13^{a}$ | $38.02^{a}$ | $41.79^{a}$ |
| $T_5$ | $26.75^{c}$ | $37.05^{d}$ | $47.22^{d}$ | $58.28^{c}$ | $69.24^{c}$ | $80.13^{c}$ | $90.90^{c}$ |
| $T_6$ | $25.75^{c}$ | $36.05^{d}$ | $46.22^{d}$ | $57.28^{c}$ | $68.28^{c}$ | $79.13^{c}$ | $89.90^{c}$ |
| $T_7$ | $20.67^{ab}$ | $28.47^{bc}$ | $30.14^{c}$ | $36.93^{bc}$ | $43.29^{bc}$ | $49.58^{bc}$ | $55.75^{c}$ |
| $T_8$ | $27.75^{c}$ | $38.05^{d}$ | $48.22^{d}$ | $59.28^{e}$ | $43.29^{bc}$ | $49.58^{bc}$ | $55.75^{c}$ |
| $T_9$ | $26.43^{a}$ | $43.29^{bc}$ | $49.58^{bc}$ | $145.44^{c}$ | $68.28^{c}$ | $79.13^{c}$ | $89.90^{c}$ |

**Table 1f: Effect of Application of Growth Retardants on Plant Height in *Schefflera Arboricola***

| Treatments | 3rd Month | 4th Month | 5thMonth | 6thMonth | 7th Month | 8th Month | 9th Month |
|---|---|---|---|---|---|---|---|
| $T_1$ | $30.72^{abc}$ | $31.98^{ab}$ | $33.15^{ab}$ | $34.18^{ab}$ | $35.12^{ab}$ | $35.97^{ab}$ | $36.69^{ab}$ |
| $T_2$ | $33.40^{c}$ | $34.61^{b}$ | $35.73^{b}$ | $36.71^{bc}$ | $37.59^{b}$ | $38.39^{b}$ | $39.06^{bc}$ |
| $T_3$ | $33.30^{c}$ | $34.84^{b}$ | $36.29^{b}$ | $37.60^{bc}$ | $38.81^{bc}$ | $39.94^{b}$ | $40.94^{bc}$ |
| $T_4$ | $27.06^{a}$ | $28.50^{a}$ | $29.85^{a}$ | $31.06^{a}$ | $32.17^{a}$ | $33.20^{a}$ | $34.10^{a}$ |
| $T_5$ | $28.12^{abc}$ | $31.50^{ab}$ | $34.79^{b}$ | $37.94^{c}$ | $40.99^{c}$ | $43.96^{c}$ | $46.80^{d}$ |
| $T_6$ | $27.12^{abc}$ | $30.50^{ab}$ | $32.57^{b}$ | $36.94^{c}$ | $39.99^{c}$ | $42.96^{c}$ | $45.80^{d}$ |
| $T_7$ | $28.79^{ab}$ | $30.72^{ab}$ | $32.57^{ab}$ | $34.28^{ab}$ | $34.89^{ab}$ | $37.42^{b}$ | $38.82^{bc}$ |
| $T_8$ | $31.98^{bc}$ | $33.77^{b}$ | $35.47^{b}$ | $37.03b^{c}$ | $38.49^{bc}$ | $39.87^{b}$ | $41.12^{c}$ |
| $T_9$ | $29.12^{abc}$ | $32.50^{ab}$ | $35.79^{b}$ | $38.94^{c}$ | $41.99^{c}$ | $44.96^{c}$ | $47.80^{d}$ |

## CONCLUSIONS

From the present findings, it can be concluded that among the different growth retardants, plant height was reduced to the maximum extent by T7 (CCC 1000 ppm) in *Dieffenbachia amoena* (42.59 cm) and *Dracaena sanderiana* (32.64 cm) compared to control (69.46 cm and 61.22cm). The treatment T4 (paclobutrazol 100 ppm) reduced plant height in *Syngonium podophyllum* (225.50 cm), *Ficus benjamina* (41.79 cm) and *Schefflera arboricola* (34.10cm) compared to control (260.29 cm, 91.90 cm and 47.80 cm). In *Scindapsus aureus*, T2 (ancymidol 1000 ppm) reduced the plant height to the maximum (206.02 cm) compared to the control (261.65 cm). (CCC 2000 ppm) in *Dieffenbachia amoena* (48.54 cm) compared to control (62.51 cm). In *Dracaena sanderiana*, T7. Plant spread was effectively reduced by T8 (CCC 1000 ppm) reduced plant spread effectively (26.17 cm) compared to the control (29.93 cm). In *Ficus benjamina*, the highest plant spread was observed in T2 T8(ancymidol 1000 ppm) (32.51 cm) and the lowest was in (CCC 2000 ppm) (38.27 cm). In I, the highest plant spread was observed in T 5 (B-Nine 1000 ppm) (35.57 cm) and the lowest was in T8 (CCC 2000 ppm) (38.93 cm).

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